

## **High-pressure experiments on phase transition boundaries between corundum, Rh<sub>2</sub>O<sub>3</sub>(II)- and CaIrO<sub>3</sub>-type structures in Al<sub>2</sub>O<sub>3</sub>**

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### **ABSTRACT**

Phase transitions in Al<sub>2</sub>O<sub>3</sub> between corundum Rh<sub>2</sub>O<sub>3</sub>(II)-type and CaIrO<sub>3</sub>-type (post-perovskite-type) phases were examined at high pressure and high temperature in a laser-heated diamond-anvil cell (DAC) based on in situ X-ray diffraction measurements. The locations of corundum-Rh<sub>2</sub>O<sub>3</sub>(II) and Rh<sub>2</sub>O<sub>3</sub>(II)-CaIrO<sub>3</sub> boundaries were precisely determined by conducting both forward and backward reaction experiments. The results demonstrate that corundum undergoes a phase transition to Rh<sub>2</sub>O<sub>3</sub>(II)-type structure above 106 GPa at 1800 K with a negative Clapeyron slope of  $-6.5 \pm 1.5$  MPa/K, generally consistent with earlier experimental and theoretical works. The Rh<sub>2</sub>O<sub>3</sub>(II)-type phase further transforms into CaIrO<sub>3</sub>-type above 170 GPa at 2300 K, indicating the transition pressure much higher than earlier experimental work but in agreement with reported GGA calculations. The Clapeyron slope of this phase transition was found to be high negative ( $-20 \pm 5$  MPa/K).

**Keywords:** Phase transition, high pressure, Al<sub>2</sub>O<sub>3</sub>, corundum, Rh<sub>2</sub>O<sub>3</sub>, CaIrO<sub>3</sub>, post-perovskite